Journal of the Society of Arts.

FRIDAY, JULY 15, 1859.

COUNCIL MEETING.

At the first meeting of the Council, since their election, Sir Thomas Phillips, F.G.S., was unanimously elected Chairman for the current year.

OPENING OF GALLERIES OF ART IN THE EVENING.

The following is the second* letter addressed by the Council of the Society of Arts to the Trustees of the National Gallery :—

Society for the Encouragement of Arts, Manufactures, and Commerce,
Adelphi, London, W.C., May 30, 1859.

SIR,—I have submitted to the Council of the Society of Arts your letter of the 17th instant, informing them "that the pictures which are about to be temporarily deposited at South Kensington, being totally distinct from the Collection of the South Kensington Museum, will necessarily continue subject to the arrangements which have hitherto been invariably observed at the National Gallery."

The Council conclude from this communication that the Trustees of the National Gallery do not propose that the Vernon and Turner collections, when located with the Sheepshanks collection, shall be opened to the public in the evening, in common with that interesting gallery and the other portions of the South Kensington Museum; and, further, from the terms of your letter, that the power to concede what this Society asks does not rest wholly with the Trustees.

The paintings which form the Vernon and Turner collections were free gifts made some years since to the public, who, up to this time, have had no means of fairly seeing them and appreciating their great value. The Sheepshanks collection was a later gift, of the same generous nature, but the prudent foresight of the donor connected it with one of the most popularly managed and accessible public institutions of the day, and it was immediately made available for the full enjoyment and instruction of the public. Convenience, by a happy chance, will shortly bring together these three collections of the best works of British artists (whether temporarily or not the public will determine). Galleries to contain them have been erected at the public expense, planned to form in every respect one commodious, continuous, and unobstructed suite, and they will constitute one great collection, and the nucleus of a still greater, truly national one, which no accidents as to management should separate, and which the convenience of the public requires should be as much one in all its external arrangement as it undoubtedly is in its own intrinsic character.

So far as the Council can judge from the construction of the Galleries, the Vernon, Turner, and Sheepshanks pictures will be opened to the public during the day to every outward sense as one collection, and visitors will freely pass, without the slightest apparent line of demarcation, from one portion to the other. But in the evening, while the Sheepshanks pictures, brilliantly lighted, will continue open to the numbers who can at that time alone derive happy and harmless instruction from them, the other two portions of this united national collection are to be shut off in darkness against the public to whom they belong, and at the very hour at which experience has shown that they may be most usefully enjoyed.

Of this the public will naturally and justly complain, and they will neither understand nor accept the reasons assigned for their exclusion. They will deem the Vernon and Turner pictures a part of the collection with which, for any purpose of exhibition, these valuable works are connected, and they will assuredly reject the notion, so opposed to their interests, that these pictures are a part of a less popularly managed collection located elsewhere, with which they have never been associated.

These considerations have induced the Council, as the representatives of the members of the Society of Arts, and of the numerous Societies in Union with it, as well as on the part of the public, to address the Trustees in reply to the communication received from them. But as the Council have some doubt as to the authority with whom the final decision may rest, they have forwarded a copy of this letter to the Marquis of Salisbury, the minister charged with the superintendence of the collections at South Kensington, and the Council will be promptly prepared, should the sanction of Parliament be necessary, to petition the House of Commons that the whole collection of pictures may be thrown open as freely as the portion given by Mr. Sheepshanks.

The Council desire me to add their entire assurance of the good feeling of the Trustees, and of their wish that the public should have every advantage from these collections, which, formed exclusively of the works of their own countrymen, address themselves to subjects and feelings best understood, and excite emotions best calculated to improve and elevate the mind.

I am, &c.,
P. LE NEVE FOSTER, Secretary.

R. N. Wornum, Esq.,
Secretary to the Trustees of the National Gallery,
Trafalgar-square, S.W.

The following is the reply of the Trustees :—

National Gallery, 31st May, 1859.

SIR,—I beg to acknowledge the receipt of your letter of yesterday's date, which I will lay before the Trustees at their next meeting. In the meanwhile, with regard to the observations therein contained, that "the Council have some doubt as to the authority with whom the final decision may rest," I enclose, for the information and satisfaction of the Council, a copy of the Act of the 19th and 20th Victoria, chap. 29, relating to the National Gallery.

I am, Sir,
Your very obedient servant,
(Signed) R. N. WORNUM,
Keeper and Secretary.

P. Le Neve Foster, Esq., Sec. Society of Arts.

The return recently moved for in the House of Lords by Lord Shaftesbury, which includes all the communications that had been addressed to the Trustees up to the 16th June, has now been printed. From this it appears that letters had been received up to that date from the following Institutions, the managers of which appear cordially to concur with the views of the Council of the Society of Arts in reference to this subject :—

Dover Museum and Philosophical Institution.
St. Mary (Islington) Working Men's Institute.
Darlington Mechanics' Institution.
Derby Working Men's Association.
New Swindon Mechanics' Institution.
British Horological Institute, Clerkenwell.
Windsor and Eton Literary, Scientific, and Mechanics' Institution.
*Yorkshire Union of Mechanics' Institutions.

* For the first letter, see present vol. of *Journal*, p. 333.

* See *Journal*, p. 532.

Ebbw Vale Literary and Scientific Institution.
Derby Mechanics' Institution.
*Young Men's Christian Association, Aldersgate-street.
Bolton Mechanics' Institution.
Wrexham Literary Institution.
Bradford Chamber of Commerce.
York Institute of Popular Science and Literature.
London Domestic Mission Reading Room, Cripplegate.
London and South Western Literary and Scientific Institution.
Middlesboro-on-Tees, Mechanics Institute.

ON THE APPLICATIONS OF WATER-GLASS IN THE ARTS.

By F. KUHLMANN, PROFESSOR OF CHEMISTRY AT LILLE.

(*Translated from the French by desire of and communicated by H.R.H. the Prince Consort, President of the Society of Arts.*)

The investigations of Prof. Kuhlmann on the applications of the soluble alkaline silicates in the Arts, are contained in a series of papers read before the French Academy of Sciences in the years 1841 to 1857. They have been collectively published in a pamphlet, the title of which is, "*Silicatisation, ou application des silicates alcalins solubles au durcissement des pierres poreuses &c., par M. Fréd. Kuhlmann. 3me édition. Paris (Victor Masson), 1858, 8vo.*" To this pamphlet the Report of a French Government Commission on the subject has been appended, which contains so clear and succinct an account of the principal features of Professor Kuhlmann's papers, that it has been selected for translation to draw public attention in England to these researches, which will prove of the greatest utility in many branches of the usefnl art.

This translation is followed by that of the practical instructions written by Mr. Kuhlmann, in 1857, for the guidance of those who wish to employ his processes, especially the one for hardening porous stone.

REPORT OF THE COMMISSION CHARGED BY THE MINISTER OF AGRICULTURE, COMMERCE, AND PUBLIC WORKS WITH THE EXAMINATION OF THE PROCESS OF SILICIFICATION OF FR. KUHLMANN, PROFESSOR OF CHEMISTRY AT LILLE.

MONSIEUR LE MINISTRE,—The Commission which you have charged by decree of October 29, 1857, to report on the results obtained by Mr. Kuhlmann, Professor of Chemistry at Lille, on the employment of soluble alkaline silicates for hardening porous stones, for painting, &c., has communicated with the inventor of this ingenious process. Mr. Kuhlmann has most readily given every assistance to your Commission. He has explained to us the theoretical principles which have gradually led him to the creation of a new industry; he has opened to us his laboratory, in which the Commission has found the realisation of all the practical facts announced by the inventor, and been enabled to follow, as it were, step by step the progress of his idea; he has likewise thrown open to our inspection his chemical works of la Madeleine and of Saint-André, near Lille, in which the manufacture of soluble alkaline silicates and of sulphate of baryta has been already carried on to a considerable extent, and is increasing from day to day; and he has shown us the various monuments and houses at Lille to which the process of silicification has been applied.

The facts which were pointed out to your Commission, and the experiments which were performed before us, are of the highest importance to science, the arts, and industry. Geological theories of the highest order with regard to the formation of rocks, the possibility of reproducing artificially and by very simple means most of the crystalline mineral matters, the transformations which have been accomplished in the organs of plants and animals the petrified remains of which we find in the bosom of the earth, stand, according to Mr. Kuhlmann's exposition, in an intimate and happy connexion with the more practical considerations concerning the formation of new cements, the hardening of porous limestones used for preserving monuments, the application and the fixation by means of alkaline silicates of mineral colours upon stone, wood, glass, metals, paper, stuffs, &c., and the substitution of a new white colour (the sulphate of baryta) for white lead and zinc white. We scarcely know what ought to be most admired in Mr. Kuhlmann,—his ingenious and scrutinising mind, or his perseverance and tenacity in pursuing the realisation of his ideas, and in rendering his methods more general, for which purpose he has not hesitated to incur considerable expense.

Theory of Hydraulic Cements.—The silicious solution, silicate of potash or silicate of soda, forms the basis of all the new processes. Since 1840, researches upon the origin and nature of the efflorescences upon walls have furnished Mr. Kuhlmann with the opportunity of ascertaining the presence of potash and soda in most of the limestones of the various geological epochs, in larger proportion in hydraulic limestones than in fat limestones (*à chaux grasse*). What would be their influence upon the hydraulic properties of the lime? Mr. Kuhlmann thought that, under the influence of potash or soda, silicious limestones might give origin, when calcined, to double compounds of lime, silica, or alumina and an alkali analogous to those which would be obtained by the calcination of some kinds of hydrated minerals, such as apophyllite, stilbite, and analcime, and that these compounds, when afterwards brought into contact with water, would undergo an action analogous to that which causes the consolidation of plaster, viz., hydratation and at last perfect hardness.

The principal effect of the potash and soda would consist in transferring a certain quantity of silica to the lime, and in giving origin to silicates which absorb water with avidity (so as to leave only that portion of water necessary to their hydrated nature) and become solidified. Numerous facts bore out this theory. Quicklime, when left in contact with a solution of silicate of potash, is immediately transformed into hydraulic lime. Quicklime and an alkaline silicate, very finely pulverised, and mixed in the proportion of 11 of silicate to 100 of lime, likewise furnish an excellent hydraulic lime. A mortar of fat lime repeatedly wetted with a solution of alkaline silicate is transformed into hydraulic mortar. Lastly, with the glassy silicate and lime, more or less energetic hydraulic cements can be produced at will, which will be found very useful in countries where only fat limestones exist.

Silicification.—From observing the great affinity of lime for silica when set free in a nascent state from its compound with potash, Mr. Kuhlmann was led to study the action of the silicates of potash and soda upon the calcareous stones —upon chalk in particular. He observed that by placing some chalk in contact with a solution of silicate of potash in the cold, a portion of the chalk is transformed into silico-carbonate of lime, whilst a corresponding portion of potash is displaced, that the chalk hardens gradually in the air and acquires a greater hardness than that of the best hydraulic cements; if the chalk is made into a paste with the silicate, it will adhere strongly to bodies, to the surface of which it is applied. Thus a cement was discovered, capable of being employed in restoring public monuments and in the manufacture of cornice-work. Pushing his experiments further, he ascertained that chalk, when plunged into a solution of silicate of potash, was capable of absorbing a considerable quantity of silica; by exposing it alternately and repeatedly to the action of the silicious solution and to that of the air, he found that this stone acquired in time a great hardness on the surface, and that the hardening, which was at first superficial, penetrated gradually to the centre, so that a piece which had been subjected to the process fifteen years ago, and which was examined by your Commission, had become hardened to a depth of nearly a centimetre. This silicification of the stone (this is the name given by Mr. Kuhlmann to this transformation) is due to the decomposition of the silicate of potash by the carbonate of lime on the one hand, and by the carbonic acid of the air on the other. A solution of

* See *Journal*, p. 521.

silicate of potash when left to the air gives origin, in fact, after some time, to a gelatinous and contractible deposit of silica and to a stratum of carbonate of potash. In course of time the deposit of silica acquires sufficient hardness to scratch glass. Two balls of chalk of the same diameter and of the same nature were silicified under the same conditions: the one was exposed to the free action of the air, and acquired more hardness than the second, which was kept under a bell-glass in an atmosphere deprived of carbonic acid. In silicification, therefore, as long as the stone is porous enough to continue absorbing silicate of potash, a sort of hydrated silico-carbonate of lime is formed, which hardens by gradually losing its water of hydratation, besides a contractible layer of silica which adds to the hardness of the stone. The carbonate of potash produces on the surface an almost imperceptible exudation, which diminishes gradually and at last disappears entirely without having in the least altered the surface of the stone; by means of hydro-fluosilicic acid Mr. Kuhlmann has succeeded in getting rid of the inconvenience which might result from this, and even in adding to the hardness of the stone. Calcareous stones thus prepared acquire a compact grain, and a lustrous appearance, and become capable of receiving a fine polish. The hardening is singularly assisted by heat; the calcareous porous stones, on being plunged into a high-pressure boiler containing a bath of silicate of potash, presented, as soon as they were withdrawn from this immersion, all the characters of compact silicious limestones without the least intervention of the carbonic acid of the air.

From limestones Mr. Kuhlmann passed on to porous stones, and has succeeded in showing that the action of the carbonic acid of the air upon silicate of potash was sufficient to effect a superficial consolidation of the stones, varying with their porosity.

Upon sulphate of lime or plaster of Paris the action of silicate of potash is essentially the same; but it is more rapid, and has the disadvantage of giving rise to the formation of sulphate of potash, which, on crystallizing, disaggregates the surfaces. Consequently the silicious solution ought to be more diluted, so as to render the action slower; the consolidation, however, must be sufficient to avoid the effects of the crystallization of sulphate of potash.

Mode of Application.—In what way does Mr. Kuhlmann apply the silicate of potash upon monuments and buildings in general? He takes silicate of potash prepared in his works and possessing the composition of soluble glass, and dissolves it in twice its own weight of water. This solution is to be had in commerce, and marks 35° of Beaumé's areometer. All that is required is to dilute this with twice its volume of water, in order to obtain the degree of concentration most convenient for the process of hardening. In recent buildings it may be applied at once; older constructions require to be cleansed by washing with a hard brush or by means of a solution of caustic potash, and most frequently by smart scraping. Large surfaces are sprinkled with the silicious solution by means of pumps or large syringes with divided jets. The latter have been employed in Germany since 1847. Care must be taken to collect the excess of liquid by means of gutters of glazed earthenware placed at the foot of the walls. For sculptures and certain portions of buildings, soft brushes are employed, and, with great advantage, also the painting-brush. Experience has shown that three applications of silicate, on three consecutive days, suffice to harden stone. The quantity of solution which is absorbed varies with the nature of the stone and its porosity; the cost of silicate does not exceed 75 centimes (7½d.) per square metre for the most porous stones.

This process has been applied to the new sculptures of the Exchange at Lille, to the works of restoration in the Church of St. Maurice, to the construction of a new church at Wasemmes, to the hospital of Seclin, to some works of the Corps du Génie, and to several private buildings at Lille; it has been found to answer perfectly.

Since the year 1841, Messrs. Benvignat, Marteau and Vorly have tested the efficacy of the new process. It has likewise been employed in other places, at Versailles, at Fontainebleau, at the Cathedral of Chartres, at the Town Hall of Lyons, at the Louvre, and at the Cathedral of Notre Dame in Paris. The best architects, such as MM. Lassus, Lefuel, Violet-le Duc, etc., having obtained most satisfactory results.

Dyeing of Stones.—Mr. Kuhlmann observing that the silicification of buildings and sculptures gave rise to various colorations which rendered, for instance, the joints more marked, was led to seek a remedy for these colourations. By means of a double silicate of manganese and potash, he obtained a dark solution which could be applied to very white limestones. By suspending some artificial sulphate of baryta in the silicious solution, he was able to introduce a little of this sulphate into the porous stone together with the silica, in such a manner as to whiten surfaces of too dark a hue. He proved experimentally that porous limestones, when boiled in solutions of metallic sulphates (the oxides of which are insoluble in water), give rise to the fixation, to a certain depth, of these oxides in intimate combination with the sulphate of lime. With sulphate of iron he obtained a rust-colour of more or less intensity, with sulphate of copper a magnificent green tint, with sulphate of manganese brown tints, with a mixture of sulphate of iron and sulphate of copper a chocolate tint, etc. He observed at the same time, that the double sulphates thus formed penetrated into the stones, and likewise increased their hardness.

Silicious Painting.—There was but one step from silicification to silicious painting. Fuchs, Professor of Mineralogy at the University of Munich, had already, in 1847, given the famous German painter, Kaulbach, all the advice necessary to enable him, by means of a sprinkling with silicate of soda, to fix the fresco-paintings which were then executed in the New Museum at Berlin. Mr. Kuhlmann went further, and applied the colours directly by means of a brush. He had observed that the action exerted by carbonate of lime upon the silicates of potash and soda, viz., the displacement of silica, was likewise exerted by the carbonates of baryta, strontia, magnesia, iron, lead, &c., and even by other salts, such as chromate of lead, most of the metallic carbonates, and even the oxides of lead and oxide of zinc.

He endeavoured at first to replace, in the application of mineral colours upon stone, the fixed and essential oils usually employed by solutions of silicate of potash. With white lead, the formation of silicate of lead was too rapid to permit the application of this colour by means of the painting-brush. Oxide of zinc gave satisfactory results. The artificial sulphate of baryta, which had already found employment in whitening stones of too dark a colour, was again usefully employed; and by mixing it in large proportion with the oxide of zinc, Mr. Kuhlmann obtained a white colour of greater brilliancy and transparency. It appeared at first that sulphate of baryta could not be employed by itself; but it was found that by applying it repeatedly by means of glue or starch paste, or by means of a mixture of starch paste and silicious solution, it covered as well as white of lead and zinc-white in painting with size or paste-colours. This observation was of the highest importance; a new white colour was found which could be employed in the place of those hitherto in use.

New White Colour (base blanche).—Your Commission has been vividly impressed with the results already obtained by the employment of artificial sulphate of baryta in the decoration of several buildings at Lille. The brilliancy and whiteness of the finest white lead is but dim when compared with painting in sulphate of baryta. This colour possesses the advantage of remaining unaltered under the influence of emanations of sulphuretted hydrogen; it enables us to execute dim or lustrous white paintings at a saving of about two-thirds. Its use must likewise appear of immense service, viewed from a sanitary point of view. It gets rid, on the one hand, of the dangers attending the manufacture and application of white lead

and oxide of zinc, on the other, of the odour of the essential oils. Mr. Kuhlmann has not shrunk from establishing the manufacture of this baryta-white upon a large scale. In his works at Loos (Nord), the native sulphate of baryta or heavy spar is transformed into chloride of barium, which, when treated in its turn with sulphuric acid, at the works of St André (Nord), is again converted into sulphate of baryta, which is thus obtained in a state of extreme division and purity. This manufacture is already capable of supplying to the trade about 600 tons per annum of the new colour, which find an easy sale.

This new branch of useful industry does great honour to Mr. Kuhlmann; and your Commission would point it out to you as an important progress. For the sake of economy and sanitary amelioration, it would be desirable to see it employed in military buildings, in barracks, schools, public monuments, and in the most humble dwellings.

Mineral Colours (Bases colorées).—Mr. Kuhlmann, passing from whites to the various coloured mineral substances, has observed that under the influence of silicate of potash or soda, the same reactions are produced; that colours which are alterable by the alkalies cannot be employed, but that the ochres may be used, as well as blue and green ultramarine, oxide of chromium, zinc-yellow, sulphide of cadmium, red lead, calcined lamp-black, oxide of manganese, &c.; that the colours which dry slowly may be rendered fit for painting by mixing them with colours which dry more readily, or by the addition of white colours which dry rapidly. He found, moreover, that colours which were ground with a concentrated solution of an alkaline silicate may be applied more readily upon silicified stones than upon those which have not been silicified; that in this latter case it is always useful to impregnate the surfaces, some little time before applying the colours, with a weak solution of silicate; that in painting apartments, the ordinary process of painting in distemper will be found sufficient; and then, to fix the colours, two coats of silicate of potash or soda, marking 6° to 10° of the areometer of Beaumé, are to be applied by means of large and soft brushes, at an interval of several hours.

Upon Wood.—Upon wood, the application of silicious painting presented some difficulties. Woods impregnated with resin do not receive the colour uniformly. Wetting with the water of the solution tends to cause the wood to crack. Ash and yoke-elm, however, answer very well with a few precautions. Mr. Kuhlmann has been able to submit to your Commission some rather old paintings upon wood which had resisted numerous washings, and the intense heat of a fire, close to which they were placed.

Upon Glass.—Your Commission has examined with the greatest interest paintings which have been executed upon glass. Artificial sulphate of baryta, applied to glass by means of silicate of potash, imparts to it a milk-white colour of great beauty; in a few days the silica is found intimately combined with it, and the colour resists washing with warm water. By the action of a strong heat, this silicious varnish is transformed into a fine white enamel. Blue ultramarine, oxide of chromium, and pulverised coloured enamels may be applied. Silicious painting upon glass is destined to find advantageous employment in the construction of church windows, whilst silicious painting upon stone will serve for mural decorations.

Following the same order of ideas, Mr. Kuhlmann has extended his researches to printing upon paper and upon stuffs, to the employment of silicate of soda in scene-painting and in dressing stuffs.

Upon Paper.—By grinding the finely-divided charcoal which is employed in the manufacture of Indian ink with the silicate, a writing ink is obtained which is almost unassailable by any chemical agent.

Upon Stuffs.—In calico-printing, silicate of potash replaces albumen, which is now employed for fixing colours. The silicious solution is mixed with the colours at the moment of printing; in a few days the design acquires such a consistency that the colours resist washing and soap, provided they are not alterable by alkalies.

Printing and Dressing Stuffs.—From a series of experiments undertaken with the view of showing that in dyeing it is not correct to assume that nitrogenous substances possess a greater aptitude for receiving colours than non-nitrogenous substances, and that dyeing rests essentially upon a chemical combination with the textile material, either in the natural state or variously combined or modified, Mr. Kuhlmann was induced to replace the albumen used in printing stuffs, either by a compound of gelatine and tannin, or by starch paste fixed upon the cloth by means of lime or baryta water, or also by the soluble silicates. In printing upon paper, he has succeeded in replacing the varnish with which it is usual to cover the colours which have been fixed by means of gelatine, by a layer of tannin, and even the gelatine itself by starch fixed by means of lime or baryta.

In the dressing of stuffs he has succeeded in introducing the use of tannate of gelatine (by means of which he obtains a permanent dressing), and that of soluble silicates.

Tannate of gelatine constitutes a sort of artificial leather, with which he covers, instead of varnish, wood, paper, chalk drawings, casts in plaster of Paris, sail-cloths, ropes for naval use, &c.

Lastly, by introducing in painting in distemper the processes discovered for fixing colours upon paper and stuffs, he has created the method of painting with tannate of gelatine, or with starch fixed by lime or baryta, or mixed with a silicious solution.

These researches constitute an extremely remarkable and striking whole. Each portion of Mr. Kuhlmann's house exhibits a specimen of one of the processes which he has pointed out; and the examination of these has convinced your Commission that most of these processes are destined to find practical application in arts and manufacture, in spite of the obstacles of routine.

Your Commission, sir, has thought it right to present you with a complete abstract of all these works, in order to show you that we have conscientiously endeavoured to accomplish the mission which you entrusted to us, and to convince you of the great merit of these several researches and discoveries.

Distribution of Pamphlets.—Your Commission feel convinced that Mr. Kuhlmann's labours are of great interest to the engineer, and has no hesitation in declaring itself in favour of distributing the pamphlets in which these processes are described among engineers, builders, and manufacturers.

Builders and engineers may any day be called upon to take advantage of the methods of hardening stones, and of silicious painting in a great number of buildings. Is it not highly desirable that their attention should be directed to these new methods, which may even receive useful modifications from their hands? May they not thus familiarise the public with these processes? Most of them, and some mining engineers, are engaged in some important researches on cements and hydraulic mortars. May they not find, in the scientific considerations presented by Mr. Kuhlmann, the germ of improvements to be introduced into the methods which they daily employ?

The distribution of pamphlets to mining officers, appears at first sight of less importance. Mr. Kuhlmann has, however, been able to introduce into his experiments scientific considerations with regard to the formation of rocks, and especially of crystallised minerals, which are very important for the history of our globe.

Geological Considerations. — On reflecting, says the author, upon the admirable reaction which causes the hardening of limestones by silica, are we not naturally led to attribute not only all infiltrations and crystallisations of silica in calcareous rocks, but also the formation of an infinity of natural silicious and aluminous pastes to analogous reactions? Are we not induced to admit that the flint-stones, the agates, petrified woods and other silicious infiltrations have had no other origin, but that they owe their formation to a slow decomposition of alkaline silicate by carbonic acid?

By simple exposure to the air, and by a slow contrac-

tion, Mr. Kuhlmann has succeeded in obtaining masses of silica hard enough to scratch glass, translucid aluminous pastes, hydrated oxyde of tin with vitreous aspect, &c. The numerous experiments undertaken by him upon this subject, and described in his pamphlets, are of the greatest interest. Several mining engineers have already undertaken analogous experiments, and Messrs. Ebelmen and De Sénarmont have obtained very remarkable results. The experiments of Mr. Kuhlmann may put these engineers who devote themselves to these studies in the way of more complete results.

In two memoirs presented to the Academy on the 9th and 16th of November, 1857, Mr. Kuhlmann throws fresh light upon the mode of explaining the silicious infiltrations and the calcareous concretions in shells,—for instance, upon the possible formation of various epigenies, upon the gradual hardening of recently extracted stones, by the slow loss of what is usually called quarry water, and lastly, upon the spontaneous crystallization of amorphous matters, in consequence of an extremely slow contraction, in which time, and also heat and pressure, constitute principal elements.

Mr. Kuhlmann, taking up some researches commenced by Fuchs, has just added fresh and important facts to his applications of the alkaline silicates in painting, in the preparation of artificial hydraulic limes, and in the silicification of calcareous stones. These results are not yet published, but have been communicated to your Commission and may be summed up as follows:—

The oxides and metallic salts which enter into the composition of silicious colours or of cements, have the property not only of combining with the silica of the silicates, but also of fixing, in an insoluble state, variable quantities of potash. The colours which act most energetically in this respect are the ochres; oxide of manganese, oxide of zinc, oxide of lead, and artificial sulphate of baryta also retain potash.

These observations, brought to bear upon the existence of potash in a large number of natural silicates, have led Mr. Kuhlmann to prepare artificially, by the humid way, various compounds of that nature,—felspars, alkaline silicates, magnesian silicates, &c. On applying them to the theory of hydraulic limes, they confirm the special character which Mr. Kuhlmann attributed to them at the commencement of his investigations.

He hopes he will be able to show that excellent cements may be obtained without the intervention of carbonic acid, merely by the slow consolidation of the silicates of lime, of alumina, or of magnesia and potash, and that the natural hydraulic limes approach more or less, in their composition and their properties, to the nature of these cements.

Lastly, Mr. Kuhlmann has obtained excellent results in the fixation of potash in the silicification of soft limestones, by substituting aluminate of potash for the hydro-fluosilicic acid, the employment of which he had advocated with a view of forming in the stone a compound analogous to mica. He thus replaces mica by felspar, which likewise fixes potash in a state of insolubility. From this, he also concludes that in calcareous stones the presence of alumina alone may explain the fixation of a certain proportion of potash, and ought to remove every fear of any alteration in silicified limestones by the slow action of time.

Geological science cannot but gain by making these results known to all those engaged in mining works; and your Commission would, therefore, strongly advocate the distribution of the pamphlets referred to amongst these, as well as amongst builders and engineers.

Conclusion.—Your Commission, actuated by a strong desire of making known and appreciated, as much as lies in its power, the important researches of Mr. Kuhlmann upon silicification, would propose in conclusion—

1. To have distributed to the services of Ponts et Chaussées and of mining, the pamphlets in which the results of Mr. Kuhlmann's works on silicification are to be found, and to call the special attention of engineers to the advantages which they may derive from the new processes.

2. To order the publication of the present report in the "Annales des Ponts et Chaussées," and in the "Annales des Mines."

Lille, Feb. 8th, 1858.

(Signed)

BOURDOUSQUIE, *Ingénieur en chef des Mines*, President.
KOLB, *Ingénieur en chef des Ponts et Chaussées.*
BOSSEY, *Ingénieur ordinaire des Mines*, Reporter.

PRACTICAL INSTRUCTIONS ON THE USE OF SOLUBLE ALKALINE SILICATES (WATER-GLASS) IN PAINTING, AND FOR HARDENING STONES.

BY FR. KUHLMANN, Professor of Chemistry at Lille.

The application of the soluble silicates in hardening stones and in painting has now been sanctioned by experience to such an extent*, that it may be considered as one of the most useful conquests which the art of building has made for many years past. This is the unanimous judgment of the most competent men of science, as expressed in learned societies, at scientific meetings, and by the International Jury of the Great Exhibition of 1855 at Paris.

I thought that little good would be done to the art of building, by merely pointing out to the public the results of new observations, or by directing attention towards the causes of the observed phenomena, and referring to their scientific, industrial, and artistic applications, but that builders and painters ought also to be specially initiated into all the details of the many useful applications of the new chemical product, which is as yet but little met with in commerce, and the employment of which is in itself an innovation in architecture and monumental painting. I have endeavoured to produce these silicates economically, and on a large scale, and to render their application practicable. By enabling builders and painters to profit by my own experience, I hope to spare them the trouble of numerous trials, which, from clumsiness or ignorance, often lead to failures, and thereby delay the general application of an invention.

Although I was determined from the beginning of my researches not to make my investigation of the soluble silicates the object of a mere French interest, I have nevertheless thought it desirable to ensure for myself the right of priority, in order to be able to repel any attempt which might be made to usurp my rights, and to give up the fruits of my researches to the public after possessing the guarantee of having them protected by letters patent, which never fail of effectually aiding a new discovery which is of interest to manufactures and the arts.

I have established works for the manufacture of the soluble silicates, or water-glass, in the Department du Nord; and the process adopted is so simple and economical, that, in spite of the present high price of the alkalies, these silicates can be delivered by the house of Kuhlmann and Co., at Lille, at the following prices:—

100 kilogrammes (200 lbs.) of silicate of potash, in solution, marking 35° Beaumé, at	35 francs.
100 kilogrammes of solid silicate of potash at..	90 francs.
100 kilogrammes of silicate of soda, in solution, marking 35° B.....	30 francs.
100 kilogrammes of silicate of soda, in solution, marking 50° B.....	40 francs.
100 kilogrammes of solid silicate of soda	70 francs.

These products are also to be had at the Central Dépôt in Paris, from M. J. Drouin, Rue Ste. Croix de la Bretonnerie, No. 21, at 5 francs more per 100 kilogrammes.

1. HARDENING OF STONES.

Silicate of potash is advantageously employed for hardening porous stones, as well as for consolidating soft sand-

* A considerable number of public buildings have been successfully treated with water-glass, amongst which are the Louvre and Notre-Dame at Paris, the Cathedral of Chartres, the Napoleon Barracks, the Exchange at Lille, and various churches and buildings in the Department du Nord.

stones or bricks. Silicate of soda, although producing the same effect with regard to hardening stones, gives rise, after some time, to unsightly efflorescences.

Preparation of the silicious solution.—A solution of silicate of 35° strength, such as may be had in commerce, contains a third of its own weight of solid or vitreous silicate. It has been made of such a strength, as to render it necessary to dilute it with twice its own volume of water, in order to obtain a liquid of the proper concentration for hardening stones. Builders who are little acquainted with chemical manipulations are thus enabled, by means of these simple indications, to employ either the solid or the liquid silicate. The silicate of 35° ought to be diluted with twice its volume of water; and the solid silicate requires to be dissolved in six times its own weight of water. The solution of the solid silicate is not quite without difficulties; it is more easily effected in water which has already been charged with a little silicate, than in pure water. This is heated to ebullition in an iron boiler, and the silicate added in the state of powder, or in small pieces.

These proportions need not, however, be rigorously adhered to. A silicious solution of a slightly different degree of concentration may still give good results. I would, however, remark that too weak solutions require frequent repetition of the process of impregnation, whilst too concentrated solutions are ill-suited for a thorough penetration, and consequently for a proper hardening of the stone.

Mode of action of the solution.—The silicious solution, when brought into contact with porous stones in the manner to be explained hereafter, is absorbed by them. After exposing them for some time to the air, they will be able to absorb a fresh portion of solution, and in a similar manner a third and a fourth; but the quantity of liquid thus absorbed diminishes with every new operation, and at last absorption ceases altogether, when the pores of the stone are completely filled with the silicious matter.

The quantity of solution which may be thus absorbed varies with the nature of the stone, the coarseness of its grain, and its porosity. It is calculated, however, that a calcareous stone of average porosity can be effectually treated with silicate at 3½d. per square yard.

The hardness of the stone will depend as well on the quantity of silicate absorbed, as on the quality of the silicate which has been employed; so that if the work is done by contract, the proprietor may be liable to serious miscalculations.

Method of applying the silicious solution.—This varies with the nature of the buildings which have to be treated. In more recent constructions it may be applied at once; but in older buildings the stones require to be cleansed, in order to facilitate the absorption of the silicious solution. Mere washing rarely suffices; and scraping will always be found preferable whenever it is applicable, or else washing and scrubbing with a hard brush, or with a solution of caustic potash; acidulated water must on no account be used.

If the stone be of small extent, such as a statuette, or a piece of ornament, the silicious solution is applied by simple immersion for some hours, which ought to be repeated several times.

Large surfaces are coated with the silicate by means of fire-engines, or large syringes with broad rose-nozzles, taking care to collect at the foot of the walls, by means of gutters made of burned clay, of plaster, or of cement, the excess of the liquid, which may again serve for fresh operations till it is entirely exhausted. When the silicification is only applied to certain portions of a building, *e.g.* upon sculptures, a soft brush may be employed, which acts like a sponge, retaining a quantity of liquid, so as to furnish to the surfaces which have to be silicified as much of the solution as by way of sprinkling or immersion.

In all cases the window-glasses have to be protected by means of cloths against the action of the silicious solution, which would leave spots which cannot be removed when once dry.

Between two successive applications of the silicious solution, an interval of several hours ought to be allowed, or, better still, an interval of a day. Three applications on three consecutive days will generally be found sufficient for hardening the stone thoroughly. If the operation be repeated too often, the stone will be found coated over with a vitreous coat of a shining disagreeable aspect, which would necessitate repeated washings with water immediately after the last besprinkling. There are, however, stones so porous that this inconvenience will hardly show itself.

The application of the silicate may be effected all the year round, except in days of hard frost. Dull weather is preferable to warm and dry weather. When the sun is shining warm, it is advisable to protect the work by means of cloths, in order to avoid too rapid desiccation.

II.—Silicious Painting and Printing.

I have substituted the application of the silicious colours by means of the painting brush for the German process, which consists in treating paintings in water-colours with the silicious solution by means of a syringe with a rose-nozzle—a process which often gives rise to unequal fixing, and which is of difficult and uncertain execution.

The application of the colours, however, is done in various ways and conditions. In painting upon stone, upon a wall, or upon glass, &c., the colours, after having been ground with water and kept in a pasty state, are immediately mixed with a silicious solution of 15 to 20 degrees, and applied exactly as in oil-painting and distemper painting, except when a very porous stone is employed, which had better be slightly silicified before applying the colours, to prevent a too rapid desiccation by the porous body; for glass and earthenware, the silicious solution ought to be more concentrated.

Painting upon wood is equally efficient, provided the wood be not impregnated with resin, which repels the colour, as would also be the case if one were to apply silicious painting over old oil-paint.

Colours acted upon by the alkalies cannot be advantageously employed for this kind of painting. Those which answer best are the ochres, blue and green ultramarine, oxide of chromium, zinc-yellow, sulphide of cadmium, red lead, calcined lamp-black, oxyde of manganese, zinc-white, artificial sulphate of baryta, &c.

Independently of this method of painting, I have with great success applied a kind of mixed style of painting to rooms, where the silicates merely serve as a means of fixing the colours, which may afterwards be washed with water. The painting is done in the usual manner in distemper, and, in order to fix the colours, two layers of silicate of potash or of soda are applied by means of the painting brush; the first layer with a solution of 6° of Beaumé's Areometer, and the second of about 10° strength, allowing an interval of some hours at least between each application of the silicious solution.

This method of fixing distemper-painting might be employed in the manufacture of coloured papers. For this purpose (as also in painting) I have substituted fecula or starch for the ordinary size, with great advantage. But as starch gives a somewhat granular paste with colours, I add to it some dextrine or soluble starch in various proportions, according to the fineness of the work to be executed.

In all these kinds of distemper-painting I employ with the greatest success as a white colour the artificial sulphate of baryta, the manufacture of which I have established on a large scale in my chemical works. This sulphate covers perfectly well when silicious colours or distemper colours are employed; it is of a perfect whiteness, entirely unalterable by sulphurous emanations, such as sulphuretted hydrogen; and its price in the state of a solid paste is only 20 frs. the 100 kilos. when ordered directly from Lille.

More information on silicification, and especially on the applications of silicates and of the artificial sulphate of baryta in painting, will be found in a publication entitled

"Applications of Soluble Alkaline Silicates," &c., 1 vol. 8vo. which may be obtained from M. Victor Masson, 17 Place de l'Ecole de Médecine at Paris, and at Lille from M. Danel, Grande Place, 18.

In this pamphlet I have treated likewise of typographic printing, and of printing on stuffs by means of silicates. This last application has been carried out in the most satisfactory manner in the large Calico Printing-works of Messrs. O'Neil and Sons at Manchester. I have also pointed out the useful application of the silicates in the dressing of stuffs or yarn. I have also recommended the use of silicate of soda, especially with a little arsenite of soda, for the preservation of timber from dry-rot and insects. M. Fuchs long since proposed this salt for rendering wood and stuffs less combustible. In Germany, experiments have lately been made with the view of substituting the soluble silicates for crystallized carbonate of soda in cleansing wool. Soap manufacturers have likewise employed the silicates in order to fix a large quantity of water in their products; whether this is to the advantage of the consumer, will scarcely bear inquiry. Lastly, one of their most useful applications consists in the fixation of mordants, which enables us to dispense with cow-dung in the manufacture of printed calicoes.

My various methods of painting have been attentively studied by Messrs. Mottez et Flandrin, historical painters at Paris; by Count de Galembert, historical painter at Tours; by M. Denuelle, decorator and painter at Paris; by M. Leclaire, who has been charged with the silicification of the new buildings of the Louvre, and with the harmonization of the tints of the new and old parts of the building, and who has likewise obtained excellent results with my method of silicious painting. I would also mention Messrs. Vicar and Brebar, painters and decorators, who have executed numerous silicious paintings at Lille.

COMPRESSED FODDER.

An ingenious invention has just been adopted by the French Minister of War for the better feeding of cavalry horses when on the march. M. Naudin, veterinary surgeon of the Imperial Guard, has succeeded in compressing the food for the journey into small tablets like those already in use composed of vegetable food for the army. M. Naudin has given publicity to his process, and it is destined, no doubt, to render immense service to the commissariat departments in every country. The hay and straw are chopped fine, the oats and corn crushed, and then mixed in proportion to the nutritive qualities afforded by each. Upon the mixture is poured a mucilaginous residue of linseed, and the whole is pressed and comes out in a hard cake, only requiring to be dried in the oven. Although invented for the emergencies of war, this method of preserving fodder may be found most valuable in reducing the space occupied by the food of cattle on board ship, in distant encampments, or in the long marches of emigration parties. At any rate the method is a valuable extension of Chollet's invention, and has been eagerly adopted for the provender of the French cavalry of the army of Italy.

INSTITUTION OF CIVIL ENGINEERS.

The Council of the Institution of Civil Engineers have awarded the following Premiums for Papers read during the Session recently concluded:—

1. A Telford Medal, to Michael Scott, M. Inst. C.E., for his Paper "Description of a Breakwater at the Port of Blyth, and of Improvements in Breakwaters, applicable to Harbours of Refuge."

2. A Telford Medal, to Robert Mallet, M. Inst., C.E., for his Paper "On the Co-efficients of Elasticity and of Rupture in Wrought Iron, in relation to the volume of the Metallic Mass, its metallurgic treatment, and the axial direction of its constituent crystals."

3. A Telford Medal, to Henry Bessemer, for his Paper "On the Manufacture of Malleable Iron and Steel."

4. A Telford Medal and the Manby Premium, in Books, to William Joseph Kingsbury, Assoc. Inst. C.E., for his Paper "Description of the Entrance, Entrance Lock, and Jetty Walls of the Victoria (London) Docks; with Remarks on the Form adopted in the construction of the Wrought Iron Gates and Caisson."

5. A Watt Medal, to James Wardrop Jameson, Assoc. Inst. C.E., for his Paper "On the performances of the Screw Steam-ship *Sahel*, fitted with Du Trembley's Combined Vapour Engine, and of the Sister Ship *Oasis*, with Steam Engines worked expansively, and provided with partial surface condensation."

6. A Council Premium of Books to Thomas Sebastian Isaac, for his Paper "On the Successful Working, by Locomotive power, over gradients of 1 in 17, and curves of 300 feet radius, on Inclines in America."

7. A Council Premium of Books to Matthew Bullock Jackson, M. Inst. C.E., for his Paper "Description of the Gravitation Water Works at Melbourne, South Australia."

THE OXFORD RAFFAELLE DRAWINGS.

The University of Oxford, during the repairs of its Public Galleries, has liberally consented to the removal of its original drawings by Raffaelle and others from Oxford to the South Kensington Museum, where they will be exhibited for the next two months. Permission has also been given to the Science and Art Department to take photographs of those drawings required to complete the extensive series of Raffaelle drawings which have been collected by the Department from public galleries, at hom and abroad.

Home Correspondence.

ANONYMOUS COMMUNICATIONS.

SIR,—Since the anonymous writer, "I," in a recent number of the *Journal* appeals to the opinion of the non-professional members of the Society as to the propriety of challenging, under a mask, another writer coming openly and unscreened before the public, or the other members of the Society, I for my part do not hesitate to protest most solemnly against such a principle being upheld by the said *Journal*. Allow me to submit to you a few of my reasons for dissenting from the doctrine of your Edinburgh correspondent.

Mr. Campbell is a professional chemist, engaged both by Government and by private parties in chemical investigations. He, therefore, has a character to sustain, and a most honourable one, too; his liberal and disinterested endeavours to promote the good of the Society are moreover known to all the members of the Society who take a real interest in the progress of science and art. Now, in the matter under discussion, he boldly took up the gauntlet which, by some mistake, was thrown at one of the lecturers who happened to illustrate his paper by introducing therein some statements made in a report by Mr. Campbell on coal and coke, and which were taken up and disputed by several members present at that lecture. Mr. Campbell's reply was not retorted by the parties most interested in so doing, but in steps into the arena, without a banner, a knight from the far North, desirous of breaking a lance with Mr. Campbell, sitting firm in his stirrups, with an open visor. A parley ensues; the unknown knight is invited to show his colours and size of his weapons. "Not I," says he, "for I submit that facts and arguments, and not persons, are the proper subjects of a scientific discussion." Quite true, Mr. "I," and I believe Mr. Campbell himself would be one of the first to coincide with you, and would feel disposed to see truth elicited, even against himself;

but he insists upon fair play, and so will all honest bystanders. Now, Sir, suppose the anonymous writer, "I," succeeded in refuting Mr. Campbell, would he not make the best of his victory before his friends, and perhaps before the public, at the expense of his adversary, who, if victorious himself, would have no such opportunity afforded to him. In chivalrous language, which must be appreciated by every man of honour, the combat is not to be undertaken on equal terms. One party is to come to the ground with uncovered breast and head, the other is to appear "*armé de pied en cap*," and with the option to retire from the contest without having shown his face, as common parlance has it.

To resume, I think that the adoption of such a doctrine by the Society would be detrimental to its best interests, since many a member would withhold a contribution to the *Journal*, which might prove valuable to the Society, rather than run the risk of losing time and temper in refuting anonymous writers. And this, Sir, is the light in which I wish you to regard these remarks, since I most readily will confess my own ignorance of the real merits of the case under discussion.—I am, &c.,

A. TOLHAUSEN.

London, July 4th, 1859.

THE ROYAL ACADEMY OF MUSIC.

SIR,—On the evening of May 11th, a paper was read before the Society, by Mr. Chorley, "On the Recognition of Music as an Art." In this paper some observations were made reflecting on the Royal Academy of Music, which, in the subsequent discussion which took place, led to some further disparaging remarks. Although some time has elapsed, if these observations are allowed to pass unnoticed a very erroneous impression will be perpetuated against an Institution which—whatever its faults—has unquestionably done good service towards advancing the Art of Music in this country. This must be my apology for trespassing on your space.

The portion of the paper referring to the Academy, commences at the paragraph, "It is true that we have what is called a Royal Academy of Music; an institution which it would be pleasanter to pass by than to enter. By entering it, some pain must be given to worthy persons, but attention must be called to the capricious basis on which that structure stands, and to the peculiarities of its organisation. These are of such a nature that, during the last twenty years, not one single artist—capable of doing England or the Academy of Music credit before the public—has issued thence; not a single singer capable of saying and singing the songs of Handel, or able to cope with foreigners in foreign singing; not a single instrumental player of any renown; not a solitary composition which has lived beyond the hour when it was transcribed from the exercise book. During twenty years past London has contained materials for such a central college as can exist in no other European capital. The illogical consequence has been that our students of both sexes have been driven abroad, partly because of the superior cheapness of instruction—partly because of its superior quality."

I have quoted the passage at length, to show the nature of the charges brought against the Institution. Unfortunately for Mr. Chorley, the period of twenty years, which was evidently fixed upon to cut off one name connected with the Academy, includes that very name. Miss Dolby did not leave the Academy till December, 1839, and was therefore a student within the period so pompously paraded—a fact that triumphantly refutes the calumny so far.

But I would ask, is this the quibbling way in which any Institution is to be judged of? Take the last twenty years of any educational establishment, and it might be difficult to find a single name prominently before the public. Where, during this very time, are the emanations from the conservatoires of Milan, Naples, or Paris? Mr. Chorley would be puzzled to find, perhaps, one single name; or if he did it would be the exception.

The Institution dates its existence from the year 1823, thirty-six years in all, that is, scarcely more than a generation; during this time it has produced many names of distinction in the musical profession, besides a very large number of qualified teachers. Mr. Chorley's limitation to the last twenty years would imply that during the first sixteen years the Royal Academy of Music has not been deficient in the amount of talent produced. Can the same be said of the conservatoires abroad?—a fact Mr. Chorley should have ascertained before he condemned the English institution.

But the real character of any educational establishment, after all, does not rest upon the chance of turning out great talent. No institution can certainly command that, especially within any given period; but it is the business of such institutions to create competent teachers, and these make their impress upon the country at large, and produce a far greater effect upon the advancement of an art than any erratic genius would do. It is the province of an Academy to turn out teachers, and this the Royal Academy has done—not niggardly, but in profusion. For it is a well-known fact, that since its foundation there has appeared a constant succession of teachers, who, establishing themselves in country towns and rural districts, have contributed most unquestionably to the progress of music. And as regards the metropolis, notwithstanding a widespread prejudice in favour of foreign masters, the students of the Academy have held, and still hold, their position as masters. A better style of teaching has been the consequence of more highly qualified teachers; and one of the causes of enmity against the Academy has been raised from the circumstance that wherever the students have settled themselves, they have almost invariably taken a high position as teachers, to the detriment, often, of many of the old established professors.

But granting that Mr. Chorley's statement is true, that during the last twenty years, no singer, instrumental player, or composer, has emanated from the Academy, it must not be forgotten that in this country all are driven to teach; whatever the talent a musical aspirant may have, he cannot devote himself to the pleasures of musical imagination; he is doomed to the daily drudgery of teaching; and who as a teacher can find time for the gratification of a higher standard of perfection? But is it true that in this period no artists have appeared? I think the answer will be found in the advertising columns of the daily newspapers. A glance at these would show at once that the names of the pupils of the Academy appear taking the principal parts as singers and instrumental players in almost every performance, and many of these may yet achieve a high name for themselves. A reputation is not made at once; it is, as all have felt, a very slow result. I will not speak of composers. They must always, like poets, be few and far between. Have any of the Government supported conservatoires abroad turned out composers during the last twenty years? If so, their rumour is a private one. I am not aware that their names have been wafted to these isles. The illogical conclusion Mr. Chorley deduces from these premises is that English students are driven abroad, "partly because of the superior cheapness of instruction and partly because of its superior quality." As for cheapness under Government support and patronage, this may perhaps be true; but in the only parallel instance, that of the Leipsic Academy, if Mr. Chorley had made inquiry instead of assertion, he would have found that though nominally cheaper, the tuition is so scanty that the students are driven to take private instruction, so that in reality the actual expense is greater than at the English Academy. As to the superior quality of the tuition in the Continental Academies, I simply deny the statement. Mr. Chorley has made the assertion, let him prove it.

As to the assertion made that many of these—the foreign professors—"have no place in our Royal Academy, and that this is to be accounted for by the dearness of life here, and the high fees to be obtained by private tutors."

This is entirely a gratuitous assumption. If they have no place here, it is because they are not wanted. I state distinctly, as a fact becoming daily more known, that the tuition of foreigners in music is certainly not better, if indeed it can be said to come up to that of the professors of this country, especially of those who have received their education at the Academy. And Mr. Chorley knows very little about professional musical tuition if he supposes that the system of deputies and subordinates is such as he has ventured to assume. The use of deputies and subordinates is confined almost wholly to the second branches of study—the principal study being always confided to a professor. And it is in this very employment of subordinates that the students who are advanced are themselves taught to teach, which is in reality one of the most important points of the whole system of professional musical education.

In the discussion that followed the reading of the paper, Mr. Chorley, in answer to a question, gives two names, Miss Dolby and Sterndale Bennett, as dating from twenty to twenty-five years ago. Unfortunately for Mr. Chorley's accuracy, Miss Dolby, as I have stated before, was a student within the twenty years, and Sterndale Bennett within the twenty-five years. The animus shown in fixing these periods is self-evident, but in this case it only recoils on Mr. Chorley himself, for his two "last great" names are without his own pale, and thus a palpable suspicion hangs over every statement emanating from such a source. Mr. Dilke only did justice to the Academy when he stated that "he felt bound to say that in his opinion the Academy had done great good to the musical science of the country at large." Mr. Costa, on the other hand, in answer to Mr. Dilke's observation "that the Academy would be the proper medium of communication with the Government," thought, "with all due respect to the Royal Academy of Music, it was no use to mend an old coat," an observation of great importance, coming from so high an authority. Does Mr. Costa know anything of the Royal Academy? Has he ever even been inside the doors? Has he ever taken the trouble to inquire into the character of the tuition given? This at least he should have done before he cast his insinuations abroad against the institution. A moment's consideration ought to have suggested to Mr. Costa, that of the instrumental performers who form the orchestras over which he presides, the students of the much-belied Royal Academy are not those who hold the lowest places; and of the singers who appear before his baton that those from the Academy are not the least worthy of their place. Mr. Costa holds a high position in this country; the English have not been backward in placing him, a foreigner, in a very prominent situation. In such a case Silence would have been becoming, whatever his opinion might be. As it is he has betrayed himself, for the true reading of Mr. Costa's remarks is a new version of the Pleasures of Imagination, in which he figures as future head of some new English academy, of very rapid and impossible pitch of perfection.

As to Government patronage, it is very questionable whether any institution would thrive under such auspices. With the support comes the interference. Can any art flourish patted by the peddling of placemen. It is not an easy thing to found an Institution. You have an Academy; it has withstood the assaults of poverty, unaided, except by a few helping hands. It has poured forth a body of practical musicians that may vie with the lists of the Continental establishments. It wants but the means, and then I do not hesitate to say it has within its own bosom all the elements that could render an institution an ornament to the country, and the worthy foster-parent of its rising talent.

From these observations it will be evident how little qualified Mr. Chorley is to make any assertion whatever relative to the Academy. In the first place he has shown he knows nothing of the system of education carried out there; secondly, he has proved he knows as little in what professional musical education consists; and lastly, he has hazarded charges without having taken the most ordinary care to arrive at the real state of the case. Such ignorance may be bliss to himself, but when thus publicly paraded it becomes an offence, especially against the whole body of Academicians, who, however, can well afford to let Mr. Chorley revel in that mist from which he blandly surmises he can see so clearly.

I am, &c.,
W. W. CAZALET.

GUM FROM CEDAR.

SIR,—The following is, I believe, the solution of the mystery of the deposit of gum on the marble specimens, when confined in drawers made of cedar, as mentioned by your correspondent, Mr. Wm. Brown.

Cedar, especially Havannah cedar, is a very porous wood, and contains a large portion of a somewhat volatile resinous gum, which in damp weather absorbs a considerable quantity of moisture. If the drawer is then closed and the temperature of the room becomes raised, the evaporation from the wood saturates the air confined in the drawer, and the marble acting as a condenser, causes the gum to deposit itself over the surface, the evaporation going on more or less rapidly according to the difference in the temperature of the drawer and of its contents. I apprehend it is the pungent smell produced by this evaporation which disinclines moths and other insects to take up their abode in cedar wardrobes, whilst the gum is not deposited on the clothes contained therein, they being too warm to act as condensers.

I have found cedar, even that which had been cut 20 years, inapplicable for cases for microscope specimens on glass and instruments, because of this peculiarity, which, however, is common to some other woods and roots—ginger especially, the evaporation from which is very rapid, so as to render it worthless for these purposes.

French-polishing the drawers inside and out would most probably cure them.

I am, &c.,
FREDERIC NEWTON.

3, Fleet-street, E.C., July 9th, 1859.

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

Delivered on 20, 21, 23 *April*, 2, 4, 5, 7, 11, 16, 19, 21, 25, 26, 28 *May and* 2 *and* 7 *June*, 1859.

Par. Numb.

241. Postage (Liverpool and Canada)—Return.
246. Brass Ordnance Factory (Woolwich)—Return.
247. Iron Ordnance Factory (Woolwich)—Return.
248. Military and Naval Officers—Return.
258. The Clock (New Palace, Westminster)—Return.
260. Spirits—Returns.
263. Post Office—Returns.
228. Lunacy—Supplement to 12th Report of Commissioners.
165. Superannuations (Public Offices)—Account.
177. Coal Mines—Returns.
220. Court of Probate, &c. (Acquisition of Site) Bill—Evidence.
245. Divine Service (Army)—Return.
253. Smithfield Site—Return.
255. Poor Relief (Ireland)—Return.
256. Pembroke Dockyard Gasworks—Return.
262. Savings Banks (Number of Depositors, &c.)—Accounts.
262 (1). Savings Bank—Return.
264. Coals, Cinders, and Culm, &c.—Account.
266. Licensed Trades—Account.
270. National Debt—Account.
221. Chichester Harbour Embankment—Return.
261. Statue Law Commission—Return.
268. Probate Court—Return.
204. Lunatics—Report from Committee.
115. Grand Jury Presentments (Ireland)—Abstract of Accounts.
232. Army (Desertions and Enlistments)—Return.
250. Small Arms—Returns.
269. Divorce and Matrimonial Causes Court—Returns.
238. East India (Punjab)—Papers relating to the Mutiny.
226. Private Bills—Return.
198. Colonization and Settlement (India)—Report.
68 (4). Trade and Navigation Accounts—(30 April, 1859).
249. Enfield Factory—Return.
257. Galway and Shannon Ports—Return.
216. East India (Artillery)—Return.

265. Excise Duties—Account.
240. Colonies—Return.
194. Ecclesiastical Courts—Return.
195. County Court Commitments—Return.
234. East India (The Nizam, &c.)—Papers.
Post Office—5th Report of the Postmaster General.
Shipowners—Copy of an Address and Correspondence.
Statistical Abstract for the United Kingdom (1844 to 1858).
Indian Army Commission—Report of Major General Hancock.
Austria and Italian States—Treaties (Political and Territorial) 1815 to 1848.
Indian Army—Report of the Commissioners.
Civil Service—4th Report of the Commissioners.
Harbours of Refuge—Report of Commissioners, Vols. 1 and 2.
Public General Acts—Cap. 10 to 35, and Table.

SESSION 1857—58.

98 (A xiv.) Poor Rates and Pauperism—Return (A).
483. Sessional Printed Papers—Numerical List and Index.
483 (1). Do. do. Titles and Contents.
510. Civil Services—Return.
Delivered on 8th June, 1859.
208. Poor Rates and Pauperism—Return (A).
Delivered on 9th June, 1859.
225. Small Tenements—Return.
Education—Report of the Committee of Council.
Delivered on 10th July, 1859.
259. East India (Railway, &c.)—Papers.
Delivered on 11th July, 1859.
Bill—Jury Trial (Scotland)—Act Amendment.
Italy—Correspondence respecting the Affairs of.

FIRST SESSION, 1859.

252. Criminal (Ireland)—Return.

SESSION, 1857—1858.

98 D. Poor Rates and Pauperism—Return (D).
Delivered on 13th, 16th, and 17th June, 1859.
18. Court of Chancery (State of the Suitors' Fund)—Return.
20. Army (Receipt and Expenditure)—Account.
2. Justices of the Peace—Return.
3. County Courts—Return.
5. Dwelling Houses (Scotland)—Return.
13. Universities (Scotland)—Ordinance (Glasgow).
14. Universities (Scotland)—do. (St. Andrew's).
15. Bonding Warehouses—Return.
21. Army (Relatives of Deceased Officers)—Statement of Sums paid.
22. Army (Officers on Half Pay, &c.)—Return.
27. Merchant Seamen's Fund—Account.

PATENT LAW AMENDMENT ACT.

APPLICATION FOR PATENTS AND PROTECTION ALLOWED.

[*From Gazette, July 8th*, 1859.]

Dated 21st June, 1859.

1488. G. Tomkins, Pontymister, near Newport, Monmouthshire—Imp. in coating metals and in the apparatus connected therewith.
1490. S. Gibbs, Eddington, Herne, near Canterbury—Imp. in apparatus for slinging horses, mules, and other animals.
1492. J. Meikle, 79, Rumford-street, Glasgow—Imp. in coating iron ships with asphalte, which improvements are also applicable to coating other surfaces.
1496. E. Oliver, King William-street—Improved medicinal mixtures for the cure of rheumatism, tic-doloreux, lumbago, cramp, sciatica, and such like complaints.

Dated 22nd June, 1859.

1502. W. Goulding, Leicester—Imp. in the construction of ploughs.
1504. W. Russell, Leicester—Imp. in wheels for ploughs, cultivators, and other implements or carriages.
1506. J. Apperly and W. Clissold, Dudbridge, Gloucestershire—Imp. in the manufacture of wheels for carriages and engines.

Dated 23rd June, 1859.

1508. J. Luis, 18, Welbeck-street, Cavendish-square—A machine for corking bottles. (A com.)
1509. C. F. Varley, 4, Fortescue-terrace, Kentish-town, and C. J. Varley, 7, York-place, Kentish-town, St. Pancras—Imp. in proving electric conductors, and in the apparatus connected therewith.
1511. E. T. Hughes, 123, Chancery-lane—Imp. in the manufacture of artificial sandstone, bricks, tiles, and similar articles. (A com.)
1513. A. Prince, 4, Trafalgar-square, Charing-cross—Imp. in alarum locks and latches.
1514. H. Doulton, Lambeth—Imp. in earthenware jars and bottles.
1515. A. V. Newton, 66, Chancery-lane—Imp. in springs for resisting sudden and continuous pressure. (A com.)

Dated 24th June, 1859.

1516. W. Lister, jun., and T. G. Garrick, Sunderland—Imp. in ships' windlasses and other like apparatuses, applicable also to the steering of ships.
1517. J. Mills, Heaton Norris, Lancashire—Imp. in the manufacture of keys and gibs, and in the machinery employed therein.
1518. A. Chesneau, 29, Boulevart St. Martin, Paris—Imp. in paddle-wheels.
1519. W. Clark, 53, Chancery-lane—Imp. in sewing machines. (A com.)
1520. G. Rodrup, Loughborough, Leicestershire—Machinery for the cutting of shives, bungs, corks, spiles, and vent or other pegs.
1521. R. Hornsby, jun., Spittlegate Iron Works, Grantham, Lincolnshire—Imp. in ploughs and in giving motion to ploughs and other agricultural implements by steam power.
1522. P. Faure and J. Pernod, Avignon, France—An improved process for utilising the residues of madder in the manufacture of garancine and other preparations of madder.
1523. J. Drury, Exley, near Halifax—Imp. in steam engines and boilers.

Dated 25th June, 1859.

1524. T. Howard, King and Queen Iron Works, Rotherhithe—Imp. in condensing steam in engines where superheated steam is used.
1525. W. J. Sluce, Bethnal Green-road, O. Murrell, Edward-street, Bethnal Green-road, and W. Hudson, Hackney-road, Middlesex—An improved method of generating steam.
1526. C. Wye Williams, Liverpool—Imp. in steam boilers.
1527. W. E. Newton, 66, Chancery-lane—Apparatus for exhibiting stereoscopic pictures. (A com.)
1528. J. Roberts, Upnor, Kent—Imp. in filters.
1529. J. Boden, Portswood-road, and W. Clark, Northern-road, Southampton—Imp. in apparatus for superheating steam.
1530. S. Russell, Sheffield—Imp. in breech-loading fire-arms, and in projectiles to be used therewith.
1531. W. Coppin, Londonderry—Imp. in apparatus for raising sunken and stranded vessels and their cargoes, and for raising and lowering other bodies into, and out of, the water, part of which improvements are applicable to raising weights generally.

Dated 27th June, 1859.

1533. G. Wrigley, Chester, and T. H. Wrigley, Mossley, Yorkshire—Imp. in self-acting mules for spinning and doubling.
1534. D. J. Fleetwood, Birmingham—An imp. or imps. in shaping metals.
1535. R. Burton, Brooklyn, U.S.—Imp. in breech-loading fire-arms.
1536. G. Smith, Buttermilk Falls, Orange County, U.S.—An improved construction of primer for fire-arms.
1537. T. Leigh and J. Line, St. Mary Cray, Kent—An imp. in paper-making machinery.

Dated 28th June, 1859.

1540. A. V. Newton, 66, Chancery-lane—Improved machinery for cutting corks. (A com.)

INVENTION WITH COMPLETE SPECIFICATION FILED.

1561. L. L. Tower, Massachusetts, U.S.—A new and useful machine for dampening and wetting paper, &c. (A com.)—30th June, 1859.

WEEKLY LIST OF PATENTS SEALED.

[*From Gazette, July 8th*, 1859.]

July 8th.

69. J. T. Forster.
72. R. D. Clegg.
83. W. Tillie.
84. D. E. Hughes.
87. C. W. Siemens.
88. F. Versmann and A. Oppenheim.
89. N. P. Burgh.
92. W. Oliver.
103. C. Beslay.
105. R. A. Lightoller.
118. T. Herbert & E. Whitaker.
126. J. Dauglish.
181. J. Latimer Clark and J. Muirhead.
211. R. Mushet.
236. I. Hammond.
265. J. Lane.
278. J. P. Booth.
497. G. Turnbull.
1083. J. Toussaint.
1153. R. Pearsall.
1155. R. D. Kay.
1203. J. H. Johnson.

[*From Gazette July 12th*, 1859.]

July 12th.

106. W. Bennetts.
110. J. Picksley and R. Sims.
112. D. L. Banks.
113. J. J. Stevens.
114. F. J. Manceaux and E. N. Vieillard.
115. J. Grist.
122. S. Holt.
125. W. Davis.
131. D. L. Banks.
431. W. E. Newton.
499 J. Robinson.
899. R. Wappenstein.
339. E. Partridge.

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

[*From Gazette, July 8th*, 1859.]

July 4th.

1578. J. Lewtas and J. Humphreys.
1583. L. Blackstone.

July 5th.

1587. A. L. S. Chenot and E. C. A. Chenot.
1588. A. L. S. Chenot and E. C. A. Chenot.
1589. A. L. S. Chenot and E. C. A. Chenot.
1590. A. L. S. Chenot and E. C. A. Chenot.
1595. W. Laing.

[*From Gazette, July 12th*, 1859.]

July 7th.

1586. R. Shaw.
1616. W. B. Adams.
1617. W. B. Adams.

July 8th.

1622. T. Jerome.
1661. W. Watt.

July 9th.

1638. R. Harrington.